ARL MATERIALS RESEARCH PROGRAM ANNOUNCEMENT
UNITED STATES ARMY RESEARCH LABORATORY
WEAPONS AND MATERIALS RESEARCH DIRECTORATE
PROGRAM ANNOUNCEMENT
FOR
THE MATERIALS CENTERS OF EXCELLENCE IN
MATERIALS RESEARCH COLLABORATION
W911NF-05-R-0013
(30 August 2005)

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EXECUTIVE SUMMARY

Purpose: The purpose of this Army Research Laboratory (ARL) **Materials Centers of Excellence in Materials Research Collaboration** Program Announcement is to solicit offers that will help to fulfill the materials research and development goals of the Department of Army. ARL intends to accomplish the research goals contained in this Program Announcement through the issuance of Cooperative Agreements under the authority of 10 United States Code (USC) 2358, Research and Development Projects. The cooperative agreements will provide for the support of collaborative materials research of critical interest to the Army related to materials for lightweight vehicle survivability and lethality. This program announcement covers collaborative research in the following three Materials Science and Engineering Research Areas (MSERAs): (1) Composite Materials Research; (2) Advanced Metals and Ceramics Research; and (3) Polymer Materials Research. The result of this program announcement will be the award of up to 5 cooperative agreements (as discussed in PART III of this Program Announcement) that will be referred to as the ARL Materials Centers of Excellence in Materials Research Collaboration. Each MSERA contains at least one specific "thematic research thrust." **Separate proposals must be submitted for each "thematic research thrust."** However, offerors may propose on more than one "thematic research thrust," i.e. by submitting more than one proposal. These "thematic research thrusts" have been selected carefully to be aligned with ARLs strategic materials research vision in the Weapons and Materials Research Directorate (WMRD) with specific emphasis on materials research relevant to lightweight vehicle survivability and lethality. For more details on the strategically focused materials research program in the Weapons and Materials Research Directorate, please refer to the "AMPTIAC Quarterly vol. 8, Number 4 – Army Materials Research – Transforming Land Combat Through New Technologies" – this is available on request from the point of contact for this Program Announcement listed below. The collaborative research will be synergistically integrated into ARL-WMRD core in-house research and development programs. It is the intent of this program to create a genuinely cost-effective collaborative program with ARL/WMRD researchers that promotes collaboration on a regular, physical, and continuing basis in the spirit of the cooperative agreement. ARL-WMRD is seeking proposals with creative strategies for sharing of resources (labor, facilities and equipment), organization of personnel exchange programs, identification of personnel with shared interests and/or complementary skills, integration of research activities, and strategies for facilitating transition of research results and new technologies to the Army.

2. Participation by Foreign Nationals: Responses to this program announcement may include performance by foreign nationals. However, access by foreign nationals to ARL facilities is limited. Thus, offerors may propose foreign nationals to work at other than ARL facilities, and during performance arrangements may be made for foreign nationals to visit ARL facilities for relatively short durations, e.g. to attend a meeting, or for a day to collaborate with ARL researchers.

3. Period of Performance: Period of Performance: Cooperative Agreement(s) awarded as a result of this Program Announcement are expected to provide for a basic performance period of

three (3) years with two (2) optional three (3) year extension periods, bringing the total performance period to a potential maximum of nine (9) years. The Government will informally assess the technical progress and effectiveness of collaborative activities of the research effort for each agreement yearly. Prior to the end of the basic period of performance (and the first option, if exercised) the Government will perform a more comprehensive assessment and based on this assessment of technical excellence and collaboration, funding availability and the current fundamental research needs and goals of ARL-WMRD, the Government may decide to exercise optional extension periods.

4. Profit or Fee: In accordance with DOD Grant and Agreement Regulations (DOD 3210.6-R), cooperative agreements awarded as a result of this Program Announcement will not provide for profit or fee.

5. Funding: This Program Announcement is issued subject to the availability of funds. Two funding levels are provided in this program announcement in PART III: "Base" and "Full Program." The "Base" funding levels represent current budgeted estimates for funding under this program. ARL has submitted the requisite documents to request continued funding for the nine-year period; however, offerors are reminded that this request is subject to Presidential, Congressional, and Departmental approval. The "Full Program" funding level provides for increases in program funding, should additional funds become available. Proposals are required to address both funding levels.

6. Proposal Submission: PART VII of this Program Announcement provides information on Proposal Preparation and Submission. Note that there are page limitations and other requirements detailed in PART VII. Proposals must be received by the ARL by **2:00 PM EST on 11 October 2005** at the following address:

U.S. Army RDECOM Acquisition Center
Research Triangle Park Contracting Division
ATTN: AMSRD-ACC-R (Richard Burkes)
4300 S. Miami Blvd.
Durham, NC 27703

Proposals received after the deadline will be handled in accordance with Attachment 1.
Facsimile transmissions or electronic media transmissions are not permitted.

7. Evaluation and Award: Evaluation and Award in connection with this Program Announcement will be performed in accordance with PART VIII of this Program Announcement.

8. Amendments: Amendments to this Program Announcement will be released via the Internet at the following website http://www.aro.army.mil under "For the Researcher". Offerors are encouraged

to monitor the website to ensure they have any and all amendments to the Program Announcement prior to submitting an offer.

9. Contact Information: All questions or comments concerning this Program Announcement shall be forwarded to the Point of Contact (POC) identified below. Interested parties are encouraged to submit comments or questions via electronic mail to the e-mail address listed below. Comments or questions submitted should be concise and to the point, eliminating any unnecessary verbiage. In addition, the relevant part and paragraph of the program announcement should be referenced. Offerors are encouraged to submit questions as soon as possible. Questions received less than one week before the due date for proposals may not be received in time to receive an answer. The POC is as follows:

Richard Burkes, Agreement Specialist
Phone: 919.549.4295, Fax: 919.549.4373

E-MAIL ADDRESS: richard.burkes@us.army.mil

10. Acquisition Schedule: The following is an estimated schedule for the events leading to award under this Program Announcement:

EVENT	ESTIMATED DATE/TIMEFRAME
Program Announcement Issued	30 August 2005
Proposals Due	11 October 2005
Negotiations Conducted	December 2005
Award	2nd Quarter FY2006

PART I
U.S. ARMY RESEARCH LABORATORY
MISSION AND VISION STATEMENTS

The mission of ARL is to execute fundamental and applied research to provide the Army the key technologies and analytical support necessary to assure supremacy in the Current and Future Force. ARL envisions a laboratory preeminent in key areas of science, engineering, and analysis relevant to land warfare; a staff widely recognized as outstanding; a laboratory seen by Army users as essential to their mission; and an intellectual crossroads for the technical community. Details on the ARL organization and mission can be found at http://arl.army.mil/. ARL operates as a unified entity at two major sites in Maryland (Aberdeen Proving Ground and Adelphi), with ancillary sites in White Sands, New Mexico; Hampton, Virginia; and Cleveland, Ohio and the Army Research Office in Research Triangle Park, North Carolina. The issuance of this Program Announcement is specific to the Weapons and Materials Research Directorate.

PART II
WEAPONS AND MATERIALS RESEARCH DIRECTORATE

The U.S. Army Research Laboratory (ARL) Weapons and Materials Research Directorate (WMRD) is a national scientific and engineering resource in ballistics and materials technologies. The mission of WMRD is to enhance the survivability and lethality of the individual soldier and the Army's advanced weapons systems. This is accomplished through a vigorous and varied program in weapons, protection, materials, and robotics oriented basic and applied research. Activities encompassed by this program include:

(1) Conceive, exploit and transition novel weapons concepts, materials and advanced technologies concepts and technologies in the areas of weapons, protection, materials, and robotics;

(2) Solve technical problems associated with developmental and fielded weapon systems;

(3) Provide technology and support for enhanced survivability and lethality system assessment and the Army's decision making process; and

(4) Reach out for new ideas from any source, ready to team and exploit them for the benefit of the Army and other services.

Currently in WMRD research in the following research areas are ongoing: Enabling Materials, Vehicle Survivability, Individual Warfighter Technology, Insensitive High-energy Munitions, Warheads and Projectiles, Smart Munitions, Lightweight Ordnance, and Electromagnetic Gun. Some examples of materials research projects that are conducted in these areas are as follows:

- Vehicle Protection Research
  - Damage Evolution of Impacted Ceramics
  - Solid Mechanics
  - Enabling Armor Materials Technology
- Enabling Materials
  - Lightweight Multifunctional Composite Materials and Structures
  - Transparent Materials
  - Multifunctional Coatings and Materials Sustainment
  - Nanomaterials Technology
- Individual Warfighter Technology
  - Lightweight Materials for Improved Individual Survivability
  - Constitutive behavior of soft and textile materials
- Warheads and Projectiles
  - Response and Modeling of Ballistic Alloys
  - Enabling Materials for Lethal Mechanisms

This Program Announcement is related to the research mission of WMRD and will be led by researchers from the Materials Division (MD) located at APG, MD. The Materials Division promotes, advances, and conducts a vigorous research program in advanced materials. Advanced

materials are critical to technological improvements in responsiveness, deployability, agility, versatility, mobility, survivability, lethality and sustainability and other functional areas of Current and Future Force systems.

Research Areas Include:

- Multifunctional Materials and Composites
- Composite Structural Materials
- Structural and functional polymers
- Materials for Lightweight Vehicle Protection
- Multifunctional Polymeric and Organic Materials
- High-Performance Fibers
- Elastomers, Adhesives, and Sealants
- Polymer Coatings and Inorganic Coatings
- Lightweight and High-Density Metals and Alloys
- High Performance Armor Ceramics
- Transparent Materials
- Nanomaterials Science and Technology
- Processing and Manufacturing Technology
- Nondestructive Materials Characterization and Testing
- Environmental Durability and Life Extension of Materials
- Computational Material Science and Mechanics
- Materials Characterization

Additional details on the strategically focused materials research program in the Weapons and Materials Research Directorate, may be found in "AMPTIAC Quarterly vol. 8, Number 4 – Army Materials Research – Transforming Land Combat Through New Technologies" – this is available on request from the point of contact for this program announcement.

WMRD has established a tradition of successful university partnership programs through its Materials Center of Excellence (MCOE). The MCOE is a unique research partnership between ARL/WMRD and universities or non-profit research institutes. An important aspect of the MCOE is the contractual vehicle utilized to execute the program. To realize the vision of ongoing collaborative research between ARL and the recipient(s), the MCOE has employed cooperative research agreements rather than grants or contracts. The Center of Excellence programs are comprised of a collection of collaborative projects between scientists or engineers at ARL/WMRD and associated faculty partners focused in a specific materials technology areas and specific thrusts of central importance to ARL/WMRD's mission. These programs are characterized by frequent interactions between scientists at ARL/WMRD and MCOE institutions, exchange of personnel (students, faculty, government researchers), sharing of appropriate facilities, joint publications and presentations, co-advising of graduate students and post-doctoral fellows, and are a demonstrated vehicle for successful transition and integration of university research into military systems.

PART III
PROGRAM OVERVIEW

A. This Program focuses on fundamental scientific issues central to the following Materials Science and Engineering Research Areas (MSERAs) and associated thematic research thrusts as follows:

MATERIAL SCIENCE AND ENGINEERING RESEARCH AREAS (MSERAS)	THEMATIC RESEARCH THRUSTS
Composite Materials Research	Thrust # 1 - Multifunctional composite materials and structures for lightweight vehicle protection
Advanced Metals and Ceramics Research	Thrust #1 - Dynamic Behavior of Non-Crystalline and Nano-structured Metallic Systems
	Thrust #2 - Dynamic Behavior and Optimization of Advanced Armor Ceramics
Polymer Materials Research	Thrust #1 - Protective Polymer Systems
	Thrust #2 - Advanced high performance fibers and fabrics

The Government reserves the right to award up to five cooperative agreements as a result of this program announcement. One award is anticipated in Composite Materials Research. Up to two awards are anticipated in Advanced Metals and Ceramics Research, and the Government reserves the right for such awards to be in the same thematic research thrust. Up to two awards are anticipated in Polymer Materials Research, and the Government reserves the right for such awards to be in the same thematic research thrust. As a reminder, each proposal is to address a single "thematic research thrust." However, offerors may propose on more than one "thematic research thrust," i.e. by submitting more than one proposal. If the same offeror is selected for award under multiple thematic research thrusts, the government reserves the right to award a single cooperative agreement for such efforts.

B. This Program will combine the best attributes of both public and private sectors. A seamless, synergistic cooperative work environment will be created by which the mission objectives of the U.S. Army will be fulfilled. The goals of this program are described below.

1. Conduct relevant and innovative fundamental research through intensive physical collaborative partnering and activities between recipients and the Army Research Laboratory, Weapons and Materials Research Directorate (WMRD) personnel on specific materials science and engineering research areas as identified and focused on specific "thematic research thrusts." These thrusts are largely aligned to ongoing WMRD research programs on lightweight materials for survivability and lethality. The overarching principle is to conduct strategically focused basic research on the underlying science and engineering in key application areas. Besides the

technical interactions with WMRD personnel, WMRD personnel also provide continuing and direct guidance on applications and on-going changes in priorities and technical needs.

2. Provide for the mutual exchange of researchers working at each other's institutions on collaborative research projects including the use of unique institution facilities by ARL/WMRD researchers and use of ARL/WMRD facilities by scientists and students from the recipient's institution(s).

C. Distribution of Funds.

The following represents the anticipated funding levels of the program for each "thematic research thrust:"

MSERA	THRUST #	BASE FUNDING/THRUST	FULL PROGRAM FUNDING/THRUST
Composite Materials Research	1	$800,000.00/year	$2,000,000.00/year
Advanced Metals and Ceramics Research	1	$350,000.00/year	$750,000.00/year
	2	$350,000.00/year	$750,000.00/year
Polymer Materials Research	1	$350,000.00/year	$750,000.00/year
	2	$350,000.00/year	$750,000.00/year

The technical/management proposal is to include a description of the proposed research effort at the base funding level, with a supplemental section describing how the proposed research effort would be enhanced should the full program level funding become available. The cost proposal is to include the proposed costs for the base funding level, with a supplemental section for the full program level, should additional funding become available.

PART IV
RESEARCH DESCRIPTION

A. The following represents the materials science and engineering research areas (MSERAs) and the associated thematic research thrusts in each MSERA for which the U.S. Army Research Laboratory (ARL) Weapons and Materials Research Directorate (WMRD) is seeking proposals:

1. Materials Science and Engineering Research Area (MSERA): COMPOSITE MATERIALS RESEARCH

a. The following is the thematic research thrust in COMPOSITE MATERIALS RESEARCH:

Thrust #1 - Multifunctional composite materials and structures for lightweight vehicle protection. In order to dramatically reduce vehicle weights and increase survivability, it is envisioned that materials and structures must be designed and utilized that serve multiple functions. Composite materials have demonstrated tremendous advantages in terms of mass efficiency for structural performance, and this class of materials also offers flexibility in design for multifunctional performance in lightweight vehicle applications. This thematic thrust seeks proposals that will focus on exploiting multifunctional behavior derived from materials synthesis, design, processing, as well as computational materials science. Research that utilizes the assembly and integration of multiple materials and/or devices into cohesive structures has been pursued previously and is of less interest in the present solicitation. Rather, this solicitation seeks research that enables the creation of inherently multifunctional materials and structures. It is vital that material elements that provide multifunctional capabilities also directly participate in load-carrying functions of the structural composite material.

Several types of functionality that augment the structural performance are being pursued by ARL-WMRD researchers. These may include power storage/generation, embedded optical/electrical communications, structural health/status monitoring, self-healing, rate-dependent energy absorption, transparent structural composites, and actuation. Areas for consideration in the area of multifunctional composite materials and structures include research on the composite constituent materials; composites processing science; and the supporting modeling and characterization necessary to provide the scientific foundation to utilize multifunctional composite materials in engineering applications. These areas may include:

- Molecular design (for example using computational materials science tools), synthesis, and characterization of new multifunctional polymer materials for composites applications. For example, the design of processible structural composite resins with high ionic conductivity; low-viscosity toughened structural resins with flame resistance; self-repairing resins; transparent structural polymer matrix materials; etc..
- New approaches to polymer-and composite interfaces and interfacial engineering for multifunctional composite materials. Traditional approaches to study the structure and durability of composite interfaces are of less interest and research topics focused on unique aspects associated with multi-functional composites structures are desired. These may include hybrid structural/ballistic interfaces; engineered interlaminar regions with controllable rate-dependent response; interfaces in transparent materials systems; interface engineering to optimize structural and electrochemical properties; engineered interfaces for embedded optical/electrical components; self-healing interfaces / interfacial regions.
- Experimental and computational mechanics of composite and multifunctional materials. Design and implementation of novel experimental mechanics tools as well as the utilization of computational methods to characterize the response of composite and multifunctional materials are of interest. Proposals that provide for new characterization capabilities and that create and validate new computational methods are desired. The development of new tools and validated constitutive behavior of composite materials properties that may be utilized by WMRD researchers is essential. Specific areas of interest are: Multi-Scale Modeling of Multifunctional Composites and Structures. Proposed research is sought that investigates numerical modeling techniques to enable the accurate prediction of composite materials response across multiple length scales (micro-to-macro) subjected to quasi-static and dynamic loading rates. Methods should incorporate latest understanding of rate/environmental dependent composite failure mechanisms found in hybrid composites structures. Techniques that establish and validate approaches to accurately represent and bridge local heterogeneities and defect structures to the global composite material (or structural) response. This includes studies on the mechanics of compliant plate coupling for multifunctional composite structures. Atomistic, molecular, and meso-scale modeling techniques to study composite materials and their constituents to enable the design and analysis of novel multifunctional composites from first principles are sought.

b. Proposals are requested for a collaborative research and educational program in support of ARL/WMRD research in lightweight composite materials for survivability. Proposals should be comprised of a collection of closely linked projects that address the thematic research thrust. The purpose of this materials science and engineering research area is to initiate a research program to explore the fundamental science necessary to realize the Army's future needs for composite material systems with emphasis on composite materials research for lightweight vehicle protection. In the specific thematic research thrust it is expected that the proposals will describe strong, cross-disciplinary, composite materials research that may include efforts in synthesis, materials characterization, experimental mechanics, processing, and computational materials science. Special emphasis should be placed on composites research of

relevance to the WMRD research mission in lightweight materials technologies for vehicle survivability applications.

c. The recipient for the COMPOSITE MATERIALS RESEARCH award must be accredited advanced degree granting educational institution and capable of providing the research support described herein over the potential nine year period of performance. The recipient must be an educational institution noted for world class research in the area of composite materials and have an established record that demonstrates strong, interdisciplinary materials science and engineering programs, a record of performing highly collaborative research, as well as a broad range of state-of-the-art advanced composite materials synthesis, processing, testing, and analysis equipment and expertise. Multidisciplinary approaches should be employed that address materials synthesis, composites processing, and property enhancements.

2. Materials Science and Engineering Research Area: ADVANCED METALS AND CERAMICS RESEARCH

a. The following are the thematic research thrusts in ADVANCED METALS AND CERAMICS RESEARCH:

Thrust #1. Dynamic Behavior of Non-Crystalline (metallic glass) and Nano-structured Metallic Systems. This "thematic research thrust" is focused on shear, and to a lesser extent, spall and deformation twinning, as the underlying deformation and failure mechanisms for many metals in many dynamic engineering environments and therefore, are key aspects of this area. A fundamental understanding of these phenomena is critical to design and construct materials for both survivability and lethality applications. The Army wants to try to quantify and model the fundamental material characteristics that control these mechanisms and create materials with designed deformation and failure modes. Some possible areas for work include the following, not listed in any prioritized order:

- Nano-structured metals: Lightweight Nano-micro Mg and Nano-micro Al for armor, Nano-tungsten – focus on underlying mechanisms of shear control; Nano Ta.
- Bulk Metallic Glass: focus on recrystallized glass and particulate composites with controlled size and percentage of second crystalline phases.
- WC/Co materials: novel processing for microstructure control and relation of microstructure (WC grain size and Co-matrix percentage) to dynamic properties, especially transverse strength and fragmentation.

Thrust #2. Dynamic Behavior and Optimization of Advanced Armor Ceramics. This "thematic research thrust" is part of the "Armor Materials by Design" Strategic Research Objective (SRO) and supports research on lightweight materials vehicle protection. The critical properties required for armor ceramics used in lightweight vehicle and personnel protection applications depend significantly on the threat, but it is now

clear that the role of processing defects is very important and the optimization of "effective dynamic plasticity" can significantly affect performance if other important mechanical properties like hardness and compressive strength are not compromised. Effective dynamic plasticity in ceramics is empirically reflected in dynamic compressive stress-strain curves as the non-linear portion of the curve prior to catastrophic failure of the ceramic. Some possible areas for work include the following, not listed in any prioritized order:

- Defects: quantitative mathematical representation and property, design, performance, modeling and simulation implications.
- Non-destructive Evaluation techniques: including both conventional defect imaging and other advanced techniques for microstructure and porosity evaluation to include very high frequency (125 MHz) ultrasonic techniques using C-scans (velocity maps) and also amplitude and other output pulse interrogation.
- "Dynamic Effective Plasticity": –We want to try to quantify and model the fundamental material characteristics that control the micro-mechanisms and physics of "dynamic effective plasticity" and create materials with designed deformation and failure modes in single phase and multi-phase materials. Work could also include validated techniques for measurement.
- Dynamic compression deformation and damage mechanisms maps: create phenomenological maps similar to Ashby deformation mechanism maps illustrating the influence of defects, amorphization, twinning, phase transitions and other relevant mechanisms.
- Grain boundary modeling and engineering: It is well known that the grain boundary phases and thickness of oxide and non-oxide materials can control their mechanical properties. In SiC materials, for example, the fracture characteristics can be changed from inter-granular to trans-granular by systematically controlling the grain boundary region. We wish to be able to more fully exploit this in armor ceramics by quantifying and modeling the effects of grain boundary control on armor performance.
- Pressureless Sintering: one of the major drawbacks for the more widespread use of advanced ceramics for armor is their higher costs, which is mainly due to their manufacture by hot pressing techniques. We wish to modify the pressureless sintering techniques for SiC and B_4C based armor to produce material comparable to the hot pressed material.
- Nano-structured ceramics: recent work on nano-structured alumina and alumina/spinel has demonstrated that hardness and "effective plasticity" is significantly enhanced and in the alumina material, the ballistic performance as well. Work is desired that will focus on techniques to systematically fabricate and dynamically test and model the properties and performance of nano-structured ceramics.
- Macro-structure control: it has been speculated that controlling the dynamic and shock properties of ceramic based materials by texturing, periodic arrays, functionally graded materials (FGM), and other means, could result in significantly improved armor performance. Systematic work including processing, mechanical testing and modeling, would be desired in one of these areas.

- Representative materials: SiC, B_4C, AlON, Al_2O_3, AlN, TiB_2 etc. Focus is on opaque armor ceramics, but work on transparent armor ceramics will also be considered.

b. Proposals are requested for a collaborative research and educational program in support of the ARL/WMRD Survivability and Lethality Research Program. The underpinning critical philosophy for both "thematic research thrusts" is an integration of processing, material characterization (phase, microstructure and defects), dynamic mechanical testing, and modeling /simulation of dynamic damage formation and failure. The Army wants to quantify and validate the critical parameters that describe the various micromechanisms and physics of compressive dynamic deformation, damage accumulation and failure for input into state-of-the-art models and simulations leading to the design and utilization of optimized lightweight materials for armor and new materials for anti-armor applications. It is very important to have state-of the-art high strain rate mechanical testing equipment and expertise and also High Resolution Transmission Electron Microscopy equipment and expertise.

c. The recipient(s) for the ADVANCED METALS AND CERAMICS RESEARCH award(s) must be accredited advanced degree granting educational institution(s) and capable of providing the research support described herein over the potential nine year period of performance. The recipient(s) must be educational institution(s) noted for world class research in the area of advanced metals and/or ceramics materials (depending on the thematic research thrust) and have an established record that demonstrates strong, interdisciplinary materials science and engineering programs, a record of performing highly collaborative research, as well as a broad range of state-of-the-art advanced metal and or ceramic materials synthesis, processing, characterization, quasi-static and high strain rate mechanical testing, analysis and modeling/simulation equipment and expertise and experience in the armor and anti-armor applications.

3. Materials Science and Engineering Research Area: POLYMER MATERIALS RESEARCH.

a. The following are the thematic research thrusts in POLYMER MATERIALS RESEARCH:

Thrust #1. Protective Polymer Systems: In this thematic research thrust, proposals are sought that address fundamental materials research associated with advanced polymers that enable lightweight vehicle protection. Research that addresses fundamental aspects of engineered polymer systems is of interest. Lightweight polymer materials are used in a multitude of Army applications in which the fundamental understanding of their mechanical and physical properties including energy absorption, deformation, and fracture is critical. Specific properties of many polymer materials (particularly at high strain rates and in harsh environments) are not fully understood nor quantified. In order to effectively use polymer materials in lightweight protection designs as well as design and synthesize new polymer materials, the Army is seeking fundamental validated engineering properties and response of engineered structural polymer materials. In this

thematic thrust, proposals are sought in which fundamental aspects of the mechanical / physical response and energy absorption in polymer materials will be investigated, quantified, modeled, and validated. Proposals are specifically requested for thermosetting and/or thermoplastic polymers used in structural/engineering applications. These applications may include optically transparent materials used for protective windows; lightweight high-performance structural polymers components for weight reduction; polymers for shock mitigation; high-performance protective coatings, and others. Fundamental studies may include experimental and computational studies of rate mechanical response, viscoelastic / viscoplastic behavior, the elucidation and quantification of rate dependent energy absorbing, deformation, and fracture mechanisms, and the development of constitutive relationships suitable for use high performance design codes used by WMRD researchers. Furthermore, research that utilizes this fundamental knowledge to synergistically design new engineered polymer systems with tunable energy absorption, adhesion characteristics, self-healing capability as a function of loading, loading rate, and or environmental stimuli are desired. Proposals are sought in which new or complementary polymer constituents are investigated that impart new or additional multifunctionality to formulated polymers and coating systems to enhance protective ability. For example, research to enable transparent polymer coating systems that possess excellent damage and scratch resistance that will enable the use of novel lightweight polymers in protective transparent system are sought. The use of thermodynamic and kinetic processes to create ordered polymer structures or coating surfaces through directed self-assembly may be considered. Proposals addressing topics within the Protective Polymer Systems thrust should employ the use of computational materials science tools to capture the complex mechanical response of polymeric materials subjected to harsh loading and environmental conditions. The creation of validated structural polymer constitutive behavior that can be used as input to ARL-WMRD modeling and simulation activities is essential.

Thrust #2. **Advanced high performance fibers and fabrics**: Fibers and fabrics are important components of several Army systems including lightweight protection systems (vehicles, munitions, infrastructure, individual soldiers), materials for tenting, flexible storage tanks, etc. The mechanical response of high performance fiber and textile materials at high strain rates and/or during exposure to harsh environments are not fully understood nor quantified. The full utilization of organic fiber systems particularly in lightweight structural applications is hindered by the poor understanding of the fundamental response of these systems. This thematic research thrust seeks proposals that address fundamental research associated with fibers and fabric-based materials used for Army applications. Some areas of interest are listed here. Research on the fundamental studies to elucidate, quantify, and validate the fundamental mechanical response of fibers, rovings, yarns, assembled textiles (woven and non-woven) is desired. This research should include the effect of loading rate and environmental conditions on the fundamental response and relate to fiber microstructure, fiber-fiber interactions, and textile architecture. The resulting research should provide for validated constitutive behavior that can be utilized in ARL-WMRD modeling and simulation activities. Next,

research that utilizes knowledge of the fundamental fiber response to design high performance polymeric fiber materials with improved mechanical properties including hybrid fiber and textile systems, novel fabric architectures, and fiber/fabric surface finishes is of interest. This area may include fundamental studies on processing and post-processing of fibers and fabric-based materials including coatings, binders, and new fiber based materials. Also, research is desired on the fundamental degradation mechanisms of polymeric fibers and fabric based materials to include the effects of moisture, ultra-violet radiation, and temperature. Research that quantifies the degradation as related to fiber, yarn, and fabric performance in a predictive manner is of greatest interest. The goal of this work is to provide the fundamental science that enables the creation of fabrics with improved damage tolerance, multifunctional capabilities, and multi-material fabric assemblies that can be used alone or as part of an engineered material solution (e.g. a coated fabric, composite, laminated assemblies).

b. The purpose of these thematic research thrusts is to initiate a research program to explore the fundamental science necessary to realize the Army-specific needs for polymer materials. In each individual thematic research thrust it is expected that the proposals will describe strong, cross-disciplinary, polymer materials research that may include efforts in synthesis, materials characterization, experimental mechanics, processing, and computational materials science. Special emphases should be placed on polymer materials research of relevance to the WMRD mission.

c. The recipient(s) for the POLYMER MATERIALS RESEARCH award(s) must be accredited advanced degree granting educational institution(s) and capable of providing the research support described herein over the potential nine year period of performance. The recipient(s) must be educational institution(s) noted for world class research in polymer materials, must have an established record that demonstrates strong, interdisciplinary materials science and engineering programs, and must have a record of performing highly collaborative polymer research.

B. All recipient(s) must be qualified to provide four types of scientific and educational support in materials science and engineering research as follows: (1) conduct innovative research in active collaboration with ARL-WMRD scientists and engineers in materials science and engineering areas; (2) provide on- and off-site symposia and educational programs for ARL-WMRD staff in the associated area(s) of materials science and engineering; (3) provide for the mutual exchange of researchers working at each other's institutions on collaborative research projects including the use of unique institution facilities by ARL-WMRD researchers and use of ARL-WMRD facilities by recipient researchers; and (4) periodic interchange of ARL-WMRD and recipient institution researchers for negotiable duration (e.g., summer interns).

C. Potential recipients are encouraged to access and involve innovative research efforts of Historically Black Colleges and Universities (HBCUs) or Minority Institutions (MIs).

D. Typical ARL/WMRD Facilities Available for Collaborative Research.

ARL/WMRD ARL has comprehensive and state-of-the-art R&D facilities at the ARL Rodman Materials Research Laboratory in Aberdeen Proving Grounds, Maryland. This large laboratory facility, dedicated in 1997, has extensive laboratory space divided into numerous laboratories and houses many Army scientists and engineers. The facility may be collaboratively utilized to accomplish the objectives of the stated materials research programs. In general, the facilities are structured to support a wide variety of materials research areas such as:

- Adhesives
- Surface and Interface Engineering
- Ceramics and related materials
- Advanced Coatings
- Composite Materials
- Computational modeling
- Corrosion prevention
- Dynamic properties of materials
- Polymers - plastics, elastomers, thermosets, fibers
- Fibers, fillers, and other reinforcements
- Materials characterization
- Materials durability and life prediction
- Materials and structural modeling
- Materials processing & manufacturing science
- Materials testing and test method development
- Metals, metal alloys, and intermetallics
- Nanomaterials (synthesis, characterization, processing)
- Nondestructive testing
- Multifunctional materials

Specialized or unique ARL/MD facilities that may be employed by researchers in all three topic areas are:

- Accelerated environmental weathering chambers
- Scanning Probe and electron microscopes
- Chemical synthesis and analysis laboratory
- Coatings laboratory
- Composite processing and fabrication facility
- Adhesive formulation, application, and processing facilities
- Gas and liquid chromatography
- Mass spectrometry
- Mechanical test and experimental mechanics facilities
- Optical microscopy and image analysis systems
- Laser Confocal Microscopy and Fluorescent Microscopy

- Polymer processing equipment
- Spectroscopy laboratory
- Thermal, dielectric, and dynamic mechanical analysis laboratory
- Transmission electron microscopy
- X-ray diffraction analysis
- X-ray Photoelectron Spectroscopy and Auger Electron Spectroscopy
- Plasma processing facility
- Corrosion test facilities
- Dynamic properties test facility
- High-speed photography
- High temperature ceramics stress rupture test facility
- Ion beam accelerator and surface modification facility
- Metal processing laboratory
- Metallographic laboratory

PART V
MANAGEMENT

A. Management of the Program.

ARL contemplates the award of cooperative agreements pursuant to 10 U.S.C. 2358 to recipients that best fulfill the Government's requirement for creating an environment where scientific/research effort can be exchanged on a daily and continuing basis to the maximum extent possible. The cooperative agreement enables truly collaborative research between the Government and the recipient(s). ARL anticipates a Program that promotes collaboration on a regular, physical and continuing basis (i.e., in an open lab environment). Sharing of resources (labor and equipment), personnel exchange programs, joint research involving personnel with shared interests and/or complementary skills, joint publication, integration of research activities, and strategies for facilitating transition of research results and new technologies to the Army are anticipated.

The Program will be run as an adjunct to ARL/WMRD's basic research program. Each of the cooperative agreements will have an assigned ARL Cooperative Agreement Manager (CAM) who will be responsible for overall management and guidance of the cooperative agreement. The recipient shall have a Recipient Program Manager (RPM) to manage the recipient's programmatic, technical, reporting, financial, and administrative matters. The ARL CAMs and their respective RPMs may appoint individuals and establish committees, as appropriate, to assist them in managing the program. External Government, academic, and/or industrial representatives may be included on the committees at the discretion of the ARL CAMs. The ARL CAMs and their respective RPMs shall meet at least quarterly or as requested by the ARL CAMs. Other individuals and committees associated with the program may meet more or less frequently, and independently, as deemed appropriate by the ARL CAMs and their respective RPMs.

Recipient RPMs in conjunction with respective ARL CAMs will be responsible for preparing the Annual Program Plans (APPs) for their respective cooperative programs and selected thrusts. The Grants Officer will review and approve the proposed APP. The APP will provide a detailed plan of research activities (including key personnel, staff rotation, facilities, and research milestones) that commits the Recipient to use its best efforts to meet specific research objectives. During the course of performance, if it appears that research milestones will not be met, the RPM will provide a proposed adjustment to the APP for approval by the ARL CAM. In addition, the ARL CAM may from time to time request that additional research be added to the APP within the scope of the statement of work.

Beginning 6-8 months after initial award a program review shall be held to evaluate performance against the current APP and begin preparation of the proposed APP for the next annual period. The Grants Officer will approve the next year's APP and funding levels. As part of this review process, one or more site visits may be required. In addition, the ARL CAMs or

their representatives will have the right to make visits as needed during the year to assess or coordinate performance.

The ARL CAMs, in coordination with the respective RPMs for each cooperative agreement, will be responsible for integrating the APPs with the overall ARL research and technology program.

B. Collaboration Activities.

A significant part of the research program is the temporary assignment of technical staff from Government-to-Recipient and Recipient-to-Government. These assignments will be undertaken to facilitate collaborative research where ongoing and continual face-to-face interaction is required, to enable a researcher to utilize unique facilities and equipment, and to facilitate the exchange of research results. In addition, these assignments will provide Government personnel the opportunity to pursue fundamental research with noted researchers, students, and post-doctoral fellows. The success of these interactive and collaborative exchanges will be assessed by the quality of the collaboration as demonstrated by joint efforts such as progress reports, joint papers, patents, and presentations.

All salary and travel costs associated with the rotation of Government personnel will be borne by the Government. All salary and travel costs associated with staff rotation of recipient personnel will be borne by the Government through the agreement.

All personnel in rotational assignments are required to comply with the safety, environmental, security, and operational regulations or requirements of the host facility.

For recipient individuals who are in rotation to the Government, ARL will provide office space, telephone connections, administrative and secretarial support and office supplies. ARL will provide computer capabilities if available, but the recipient shall provide rotating individual(s) with computing capabilities necessary to conduct the research if they are not available at ARL subject to the requirements of the APP.

The following represents the Government's expectations concerning exchange of researchers:

1. COMPOSITE MATERIALS RESEARCH – During a typical year, it is estimated that an average of 3-5 ARL employees will be in residence at the university 2-5 days per week to perform collaborative research. A possible scenario is that 1-2 ARL employees will be in full-time residence at the university and that 2 employees may spend 2-4 days at the university in an average week. As many as 20 employees might visit the university for meetings and seminars 1-4 times during a typical month. Similar numbers of university researchers/students will be expected to rotate into ARL at the same rate, with higher frequency expected during the summer.

2. ADVANCED METALS AND CERAMICS RESEARCH - For both of the thematic research thrusts in this MSERA, the same level of collaboration is expected. During a typical year, it is estimated that an average of 1-3 ARL employees will be in residence at the university 1-5 days per week. A possible scenario is that 1-2 ARL employees will be in full-time residence at the university and that 1-2 employees may spend 1-3 days at the university in an average week. As many as 20 employees might visit the university for meetings and seminars 1-4 times during a typical month. Similar numbers of university researchers/students will be expected to rotate into ARL at the same rate, with higher frequency expected during the summer. These examples of interaction and collaboration can be modified by mutual agreement between the ARL CAM and the RPM(s).

3. POLYMER MATERIALS RESERARCH: Research Topic Area - For both of the thematic research thrusts in this MSERA, the same level of collaboration is expected. For each thematic research thrust it is estimated that 1-3 ARL employees and 3-5 researchers from the recipient institution(s) will participate in the exchange program. The exchanges may include continuous part-time residence of researchers (i.e., 1-3 days per week), sabbaticals (up to 6 months in duration), or shorter-term periodic visits (i.e., one week per month, or one month intervals 3-4 times per year). In addition to the exchanges, on occasion as many as 20 Army employees may visit the recipient's facilities for short periods (1-5 days) for progress meetings, workshops or seminars.

C. Educational Program.

Offerors shall identify educational opportunities relating to the research area proposed upon for ARL/WMRD scientists and engineers and for assisting in the transition of basic research conducted under the program to the user community. Special topic courses, seminars, or workshops may be offered as part of the program both to ARL employees and the broader university and user community. Such courses, etc. would not be as academic credit or as substitutes for regular university or long-term training. The research areas and number of university undergraduate students, graduate masters and doctoral candidates, postdoctoral Fellows, faculty and other research staff conducting research supported by this program should be identified in proposals. The ARL CAMs and their respective RPMs would have joint approval authority for selection of the postdoctoral Fellows.

PART VI
COOPERATIVE AGREEMENT OVERVIEW

The Program is to be implemented through the use of cooperative agreements. A cooperative agreement is generally shorter, simpler and less restrictive than a typical Government contract. Use of cooperative agreements by DoD elements are subject to the DoD Grant and Agreement Regulations (DoD 3210.6-R). The most recent version of the regulations can be found at http://alpha.lmi/org/dodgars. Offerors are advised to pay special attention to Appendix A to Part 22 of DoD 3210.6-R. Appendix A sets forth the required offeror certifications, suggested award provisions for national policy requirements, and the administrative requirements and issues to be addressed in award terms and conditions.

PART VII
PROPOSAL PREPARATION AND SUBMISSION

This part provides information needed in preparing research proposals for submission in connection with this program announcement.

A. **General**.

1. Proposals must be submitted according to the instructions contained herein.

2. Offerors are reminded that a proposal may only address one thematic research thrust. In the event the offeror desires to propose on more than one research thrust area, a separate proposal must be submitted for each thematic research thrust.

3. Offerors shall submit their proposal(s) to the following address:

U.S. Army RDECOM Acquisition Center
Research Triangle Park Contracting Division
ATTN: AMSRD-ACC-R (Richard Burkes)
4300 S. Miami Blvd.
Durham, NC 27703

B**. Each proposal shall consist of the following:**

1. Hard copies of the separately bound proposal items/volumes listed below; and

2. Soft copies of the proposal on CDs in PDF format as called for below.

(Note: Each of these items shall be separately bound.)

PROPOSAL VOLUME	QUANTITIES
Proposal Cover Sheet – See Attachment 2 to the Program Bulletin	• Qty - Original and 2 hard copies

Technical/Management Volume	• Qty – Original and 10 hard copies • Qty 10 – CDs
Cost Volume	• Qty Original and 5 hard copies

C. **Technical/Management Volume**.

Contents of the Technical/Management volume shall detail the proposed research program and proposed plan for program management for the specific thematic research thrust. The volume must begin with a program summary of not more than one (1) page. The volume is also expected to explicitly address the evaluation criteria set forth in PART VIII of this Program Announcement. The Technical/Management proposal is to include a description of the proposed research effort at the base funding level, with a supplemental section (included in the 50 page maximum for this volume) describing how the proposed research effort would be enhanced should the full program level funding become available. All pages included in the Technical/Management Volume shall be numbered. Offerors are advised that the Technical/Management Volume of the proposal shall not exceed 50 pages, utilizing one side of the page. The 50 page maximum does not include biographical sketches for key personnel. Biographical sketches shall be limited to two (2) pages per person. Offerors are cautioned that pages in excess of the 50 page limitation, and pages in excess of the 2 page limitation for the Biographical Sketches, will not be included in the evaluation.

D. **Cost Volume**.

1. The cost portion of the proposal shall contain cost estimates sufficiently detailed for meaningful evaluation. For budget purposes, assume a performance start date of 1 January 2006. Budgets must be presented by cost elements as detailed in paragraph 3 below.

2. The total proposed amount shall not exceed the funding levels identified for each thematic research thrust in PART III of this Program Announcement. The cost proposal is to include the proposed costs for the base funding level, with a supplemental section for the full program level, should additional funding become available. The proposal is to be broken down to include the following:

a. Direct labor categories, labor rates and labor hours associated with the effort.

b. An itemized list of permanent equipment to be acquired showing the cost of each item. Permanent equipment is any article of non-expendable tangible personal property having a useful life of more than two years, and an acquisition cost of $1,000 or more per unit.

c. Costs associated with ongoing collaborative activities to include travel, extended lodging, and other expenses.

d. A general description and total estimated cost of expendable equipment and supplies.

e. Contemplated expenditures for travel with brief explanation of purpose. Estimated costs should include destination, number of people, number of days, airfare, per diem and transportation.

f. Other direct costs (e.g., publications, computer costs, insurance).

g. Cost for consulting services, if any, showing number of days, daily rate, and estimated travel/per diem costs. The need for consulting services must be fully justified.

h. For proposed sub-recipients, a description of services or materials that are to be awarded by subagreement. For awards totaling $10,000 or more, provide the following specific information:

(1) If known, the identification of the proposed sub-recipient and an explanation of why and how the sub-recipient was selected or will be selected.

(2) Whether or not the award will be competitive and, if noncompetitive, rationale to justify the absence of competition.

(3) The proposed cost in sufficient detail to allow for meaningful evaluation, i.e. an elemental breakdown of cost comparable to what is described in Paragraph 4.D.3 above.

i. Indirect rates and associated costs and the time frames to which they are applicable.

j. A clear identification and explanation of any proposed cost-sharing costs and cost-sharing arrangement, to include the amount or ratio of cost share, when such cost share will be provided, and the evidence of a commitment from the offeror to provide such a cost share.

E. **Administrative**.

1. **Proposal Information**. The entire proposal should be concise, utilizing one side of the page with no fold-out pages. Each proposal must be typed (no type smaller than 11 point or 12 pitch on standard 8 1/2" X 11" paper with one (1) inch margins, 6 lines per inch).

2. **Bindings**. Proposals should be adequately bound in a manner which allows for ease in separation to facilitate the evaluation process. Separately bound volumes shall be submitted for the Technical/Management Volume and the Cost Volume.

3. **Marking of Proprietary Proposal Information**. The proposal submitted in response to this Program Announcement may contain technical and other data that the offeror does not want disclosed to the public or used by the Government for any purpose other than proposal evaluation. Information contained in unsuccessful proposals will remain the property of the offeror except for that evidenced in the Proposal Cover Sheet and Program Summary. The Government may, however, retain copies of all proposals. Public release of information in any proposal submitted will be subject to existing statutory and regulatory requirements.

If proprietary information which constitutes a trade secret, proprietary commercial or financial information, confidential personal information, or data affecting the national security, is provided by a offeror in a proposal, it will be treated in confidence, to the extent permitted by law, provided that the following legend appears and is completed on the front of the proposal:

> For any purpose other than to evaluate the proposal, this data except for that contained in the Proposal Cover Sheet and Program Summary shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed in whole or in part, provided that if an award is made to the offeror as a result of or in connection with the submission of this data, the Government shall have the right to duplicate, use or disclose the data to the extent provided in the cooperative agreement. This restriction does not limit the Government's right to use information contained in the data if it is obtained from another source without restriction. The data subject to this restriction is contained in page(s) _____ of this proposal.

Any other legend may be unacceptable to the Government and may constitute grounds for removing the proposal from further consideration and without assuming any liability for inadvertent disclosure. The Government will limit dissemination of properly marked information to within official channels.

In addition, the pages indicated on the proposal cover sheet as restricted must be marked with the following legend:

> Use or disclosure of the proposal data on lines specifically identified by asterisk (*) are subject to the restriction on the cover page of this proposal.

The Government assumes no liability for disclosure or use of unmarked data and may use or disclose such data for any purpose.

In the event properly marked data contained in a proposal in response to this Program Announcement is requested pursuant to the Freedom of Information Act, 5 USC 552, the offeror

will be advised of such request and prior to such release of information will be requested to expeditiously submit to ARL a detailed listing of all information in the proposal which the offeror believes to be exempt from disclosure under the Act. Such action and cooperation on the part of the offeror will ensure that any information released by ARL pursuant to the Act is properly determined.

PART VIII
PROPOSAL EVALUATION AND AWARD

A. All information necessary for the review and evaluation of a proposal must be contained in the technical/ management and cost volumes of the proposal. No other material will be provided to the evaluators.

B. **Evaluation Factors**. Proposals submitted in response to this program announcement will be evaluated against the evaluation factors set forth below, using an adjectival and color rating system.

Technical:

Factor 1. **Technical Quality**. Evaluation of this factor will concentrate on the innovative aspects of the technical proposal and proposed approach to accomplish program and research objectives.

Factor 2. **Relevance to ARL Weapons and Materials Research Directorate (WMRD) Mission**. Evaluation of this factor will concentrate on the relevance of proposed research to the ARL/WMRD mission. The effectiveness of the proposed research on addressing high priority scientific challenges and technical barriers currently facing Army materials research will be evaluated.

Factor 3. **Experience and Qualifications of Technical Staff and Quality of Research Facilities**. Evaluation of this factor will review the qualifications, publications, capabilities, availability, and experience of the offeror's research personnel, their relevant past accomplishments in collaborative multidisciplinary research, and their ability to achieve the proposed technical objectives. The type, nature, and quality of the research facilities that will be used in the proposed research will also be assessed.

Management:

Factor 4. **Collaboration Plans**. Evaluation of this factor will focus on feasibility of the plan put forth by the offeror(s) for creating a genuinely cost-effective collaborative program with ARL/WMRD researchers that promotes collaboration on a regular, physical and continuing basis (i.e., in an open lab environment) in the spirit of the Cooperative Agreement. Creative strategies for sharing of resources (labor and equipment), organization of personnel exchange programs, identification of personnel with shared interests and/or complementary skills, integration of research activities, and strategies for facilitating transition of research results and new technologies to the Army will be assessed. Access to the offeror's facilities will also be evaluated.

Factor 5. **Educational Opportunities**. Evaluation of this factor will examine the cost effective accessibility and quality of on- and off- site educational opportunities.

Factor 6. **Program Management and Execution**. Evaluation of this factor will assess the adequacy of the overall management (business) plan, internal team structures and composition with respect to achieving the technical goals of the program. The extent to which the offeror has connected with and leveraged innovative research efforts involving Historically Black Colleges and Universities (HBCUs) or Minority Institutions (MIs) will also be assessed. The offeror's plan for program execution will be assessed to include the offereor's ability to develop and follow a program plan in accordance with Army obligation and disbursement goals.

Factor 7. **Cost.** While cost will not be scored, the quality of cost information submitted and the adequacy of cost support provided will be evaluated. Cost realism, cost reasonableness, and affordability within funding constraints will be considered. The capability of cost sharing and leveraging of this program from other sources will also be considered favorably.

C. **Relative Importance of Evaluation Factors**:

Technical	
Factor 1 - Technical Quality	20%
Factor 2 - Relevance to ARL/WMRD Mission	20%
Factor 3 - Experience/Qualifications of Technical Staff	10 %
Management	
Factor 4 - Collaboration Plan	30%
Factor 5 - Educational Opportunities	5%
Factor 6 - Program Management and Execution	15%

D. **Basis of Award**.

Award(s) will be based on an integrated assessment of each offeror's ability to satisfy the program announcement requirements. The Government reserves the right to award without discussions. If discussions are held, offerors will be invited to submit Final Proposal Revisions, which will be evaluated using the same evaluation procedures as were used with the initial proposals. The Government will make award(s) to those offerors, conforming to the solicitation, that offer the best value to the Government, cost and other factors considered. Further, awards may be made to other than the offerors who offer the lowest cost proposals. ARL reserves the right not to make an award in any research topic area for which no acceptable offer is submitted. The Government reserves the right to award a single cooperative agreement that addresses more than one thematic research thrust, should the same offeror be selected for more than one award.

ATTACHMENT 1
LATE SUBMISSIONS

1. Offerors are responsible for submitting proposals, and any revisions, and modifications, so as to reach the Government office designated in this program announcement by the time specified in the program announcement.

2. Any proposal, modification, or revision, that is received at the designated Government office after the exact time specified for receipt of proposals is "late" and will not be considered unless it is received before award is made, the grants officer determines that accepting the late proposal would not unduly delay the program; and—

(a) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of proposals and was under the Government's control prior to the time set for receipt of proposals; or

(b) It was the only proposal received.

3. However, a late modification of an otherwise successful proposal, that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

4. Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

5. If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the Government office designated for receipt of proposals by the exact time specified in the program announcement, and urgent Government requirements preclude amendment of the program announcement proposal due date and time, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the program announcement on the first work day on which normal Government processes resume.

6. The grants officer will notify any offeror if its proposal, modification, or revision was received late, and will inform the offeror whether its proposal will be considered.

7. Late proposals and modifications that are not considered will be held unopened, unless opened for identification, until after award and then retained with other unsuccessful proposals.

ATTACHMENT 2
PROPOSAL COVER SHEET
(to be completed and submitted with EACH proposal)

1. Materials Science and Engineering Research Area/thematic research thrust FOR WHICH PROPOSALS ARE BEING SUBMITTED: proposals to be submitted based on the identified themes listed below.
   (Place X by Appropriate Title)

   _____ COMPOSITE MATERIALS RESEARCH:
   THRUST #1: Multifunctional composite materials and structures for lightweight vehicle protection;

   ------- ADVANCED METALS AND CERAMICS RESEARCH:
   _____THRUST #1: Dynamic Behavior of Non-Crystalline and Nano-structured Metallic Systems.
   _____ THRUST #2: Dynamic Behavior and Optimization of Advanced Armor Ceramics.

   --------POLYMER MATERIALS RESEARCH Polymer Materials Research
   _____ THRUST #1: Protective Polymer Systems;
   _____ THRUST #2: Advanced high performance fibers and fabrics

2. PROPOSAL AMOUNT :
   BASIC PERIOD OF PERFORMANCE (BASE PROGRAM):
   BASIC PERIOD OF PERFORMANCE (FULL PROGRAM):
   OPTION 1 (BASE PROGRAM):
   OPTION 1 (FULL PROGRAM):
   OPTION 2 (BASE PROGRAM):
   OPTION 2 (FULL PROGRAM):

3. NAME AND ADDRESS OF ORGANIZATION:

   TECHNICAL POC FOR ORGANIZATION:
   PHONE, FAX AND EMAIL FOR TECHNICAL POC:

   BUSINESS POC FOR ORGANIZATION:
   PHONE, FAX AND EMAIL FOR BUSINESS POC:

4. LISTING OF THE NAMES OF ALL SUB-RECIPIENTS INCLUDED IN THE PROPOSAL:

5. SIGNATURE OF PERSON AUTHORIZED TO SUBMIT THE PROPOSAL AND BIND THE ORGANIZATION:

TYPED NAME AND TITLE OF PERSON SIGNING THE PROPOSAL:

DATE THE PROPOSAL IS SIGNED: